

NEWER CONCEPTIONS OF OPERATIVE TECHNIC IN CLEFT PALATE AND HARELIP.

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"THE treatment of cleft palate," said Lane, "like surgical treatment generally, has long been a matter of creed and tradition." It is remarkable with what indifference old conceptions and practices, crudities of operative technic and errors of surgical judgment are passed from one text-book to another. There is much unserviceable and confusing matter which with profit may be eliminated from this chapter.

It is an old and quite generally accepted view that to operate for cleft palate on a child under three months of age is unwise. This is a matter of tradition. It is now, with reason, contended that under ordinary conditions cleft palate should be operated upon within the first week after birth. There is little substantial support for the statement that infants do not bear operations well. It is borne out by experience that the reverse is true.

Lane, who declared the best time for cleft palate operations to be the day after birth or as soon thereafter as possible, and whose position at first seemed open to criticism, has many followers.

Many operators have expressed an assured conviction that the new-born child bears surgery much better than has been imagined, the reasons for which circumstance, all previously stated elsewhere by Garretson, Brophy, Lane and others, are as follows:

1. The baby weighs more just after birth.
2. Resisting power has not been reduced by the breathing in of cold air through a roofless mouth.
3. Digestion has not been impaired by unsatisfactory feeding.

4. The bones are softer.
5. The impression of pain is not so acute.
6. The child has not developed the habit of articulating through the cavern of the nose.
7. By immediate operation, the muscles of the palate are given an opportunity to develop instead of atrophy, and there is afforded the greatest possibility of development of the nasopharynx as the result of the pressure exerted by the air as it passes through.

8. After early operations the nose is gradually pushed forward by the growth of the septum.

Brown (*Journal A. M. A.*, March 2, 1907) and Ferguson (*Journal A. M. A.*, May 9, 1908) counsel in favor of a reasonable delay to the end that the operation can be done with the proper assurance of safety. They do not deny the advantage of early operation if conditions are favorable.

Lane has observed that "after operations during the first week, the infant rarely cries or shows evidence of being in pain. It is almost never sick after the anæsthetic and takes its food within an hour or two with evident enjoyment."

The very fact that the infant has just passed through the birth canal, with all the brutal mechanical insults which may be incident to this excursion, suggests the presence of a tolerance to traumatism which becomes less in evidence as the infant grows older.

In ordinary cleft palate operations during the first week, the loss of blood should be trivial, but however this may be, the danger from loss of blood is not greater than at a later period. Experience has not suggested the slightest foundation for the truth of the statement that young infants do not bear the loss of blood well. If there is any reliable evidence to the effect that a very young infant does not bear the loss of a given proportion of its blood as bravely as an older individual, we have no knowledge of it.

The vital resistance against trauma and hemorrhage of guinea-pigs and rabbits has a higher index upon the day after birth than upon succeeding days. B. D. Meyers, of Indiana

University, states that "a baby rabbit can be operated upon up to twelve hours after birth without an anæsthetic and with no apparent perception of pain, there being no outcry during such a procedure as the enucleation of an eyeball. Eighteen hours after birth such operations cause the animal to cry out."

Meyers calls attention to a probable relationship between these phenomena and the circumstance that at the time of birth the sensory nerves are in an imperfect state of medullation and are, therefore, not good conductors.

It is not known at what time medullation becomes complete in the human. Osmic acid is known to blacken medullated nerves but the nerves do not blacken with this agent up to fourteen hours after birth.

Another phenomenon of interest in this connection referred to by Meyers may be noted by removing first the heart of a rabbit twelve hours old and then that of another rabbit twenty-four hours old. The heart of the twelve-hour rabbit will continue to beat for an hour and a half, whereas the heart of the twenty-four hours' old animal will cease almost immediately.

This single phenomenon, if it may be taken to indicate anything, suggests a marked difference in vitality (even if it be of an automatic sort), or a great difference in sensitiveness to external influences.

Lane ("Cleft Palate and Harelip," Med. Pub. Co., London, 1908) lays the utmost stress upon the importance of early nasopharyngeal breathing as a factor in the development of this passage. He regards the continuous ballooning of this tract by air as the greatest developmental factor, concerning not only the walls of the space but also the adjacent bones.

The conclusion that closure of the cleft in no wise remedies defective speech has been formulated by the observation of cases operated upon too late. Precise closure of the cleft does remedy defective articulation if the operation be done early enough in the period of growth.

Surgeons who believe in the immediate operation of Lane proceed from the postulate that, if the cleft be closed

during the first week, the nasopharynx is systematically and forcibly dilated and ventilated and is increased in calibre as the constantly increasing volume of air passes through it. There is very little good in trying to develop a stunted nasopharynx after a late operation. In addition to the narrowing of the nasal passages, the lungs steadily become weaker and the adenoids more abundant from the day of birth.

It is unfortunate that there is not better understanding upon the question of whether in cases of coexisting harelip and cleft palate, the two conditions should be corrected at the same time or whether the two deformities should be corrected at two distinct operations. It is clear that when both conditions are operated upon at the same time, the palate should be treated first for the reason that the presence of the defect in the lip provides readier access to the palate.

Brophy waits until the palate has completely closed and the patient has recovered before devoting any attention to the lip. Lane treats the lip and the palate at the same time. In this controversy, most operators prefer to follow the teachings of Lane and operate upon the lip and palate at the same time or operate upon the palate after the lip has healed.

In complete cleft of the palate, Lane's plan of correcting both deformities at one operation may be considered seriously for the following reasons, enumerated by himself (*Ibid.*):

The first and most important reason is that the soft parts which are removed necessarily from the margins of the lip may be of the greatest service in completing the closure of the anterior part of the cleft of the palate. "Indeed, to one unfamiliar with the employment of these portions of the lip in this manner, the large area of cleft which the pieces of lip can be made to close is most striking. They have a remarkable vitality and bear an extraordinary amount of handling and suturing with safety."

The second reason is that postponing the harelip operation for a time reduces the chances of union.

The third reason is that the sooner the pressure of the complete lip is brought to bear upon the segments of the upper

jaw as well as upon a displaced premaxilla, should it exist, the more rapid is the approximation of the bones forming the front of the cleft and the restoration of the premaxilla to its normal relationship. The mucoperitoneum covering the premaxilla is also useful in helping to close the cleft.

The pressure which is exerted upon a protruding premaxilla by the lip after its continuity has been effected is, in the opinion of some surgeons, sufficient to bring about its backward displacement into the interval between the two maxillæ.

Sherman (*Surgery, Gynecology and Obstetrics*, June, 1908) remarks that "the pull of the repaired lip is quite rightly credited with narrowing the cleft of the palate, and this is a thing definitely to be desired in many instances. Therefore, for the sake of getting a palate on which an adequate palate operation can be done, the malposition of the intermaxillary bone must be corrected and the operation upon the harelip must be done. In comparison with this consideration, the fact that the palate operation has to be done through the smaller opening of the repaired mouth is a mere matter of manipulative dexterity."

If the harelip be closed very early, the backward displacement of a protruding premaxilla takes place with rapidity, but if the harelip and cleft palate are ignored for months or years, it will be necessary to free the premaxilla with a chisel before it can be pushed back into the interval between the two maxillæ in front. No part of the prolabium or premaxilla should ever be cut away, but it should always be used to assist in closing the gap between the maxillæ where the cleft of the lip is bilateral or that of the palate is complete.

Occasionally the rolled up piece of tissue hanging from the tip of the nose is promptly and confidently cut away, the family physician either being ignorant of the value of the prolabium in closing the defect of the lip or perhaps being unable to understand at all the meaning of the presence of this centrally developing portion of the lip.

Although both Lane and Brophy are not averse to operating with the patient in the dorsal recumbent position, it will be,

in most cases, desirable to so drop the head of the operating table that there is inclination of about twenty degrees, the baby's head hanging over a pillow (Fig. 1). In very small infants the same result may, of course, be accomplished by simply elevating the shoulders upon a small, hard pillow.

To obviate the collection of blood in the pharynx is an important matter and can be accomplished best with the patient in Rose's head-hanging position, the height of the operator's stool being so adjusted that the top of the child's head comes to rest upon his knee.

In cases of complete cleft of the palate, Lane's gags with sharp teeth which bite into the gum are useful. In complete cleft the jaw clutch of the Whitehead gag is in the way of the operator at the anterior end of the cleft. Lane's lateral gags, one for each side, placed at the corners of the mouth, allow free access to any part of the cleft. In incomplete cases, the Whitehead gag meets every requirement. Brophy's tubular speculum gag limits access to the field of operation and adds to its difficulties.

In denuding the margins of the cleft, the strip of mucous membrane should be removed, if possible, from the entire edge in one piece in order that the denudation may be complete all around. If the two sides of the cleft are denuded separately, there is considerable likelihood that a small piece of mucosa may be left at the apex. In the presence of blood and mucus, obscuring the field of operation, such a small piece of mucosa may be allowed to remain, interfering with union at a critical spot. Denudation should begin at the tip of the uvular half upon one side and continued all around the edge of the cleft, finishing at the tip of the opposite half of the uvula.

In cutting off the strip, the knife should be so held that more membrane is cut from the nasal than from the oral side of the palate. Binnie advises that this strip be cut in the reverse manner. It is difficult, however, to understand his reason for so doing.

It is perhaps easier to bring the raw surfaces together with a simple suture if cut so that the oral side is bevelled.

If, however, mattress sutures, as used by Sherman, are to be employed, the desirability of cutting with the bevel upon the nasal side is quite apparent.

A cataract knife or slender tenotome is suitable for the denudation. In any case, the knife should be slender enough that the turn can be made at the apex without breaking the continuity of the strip (Fig. 2).

It is obvious that in cases of complete cleft of the palate it will not be possible to remove the strip of mucosa in one piece.

In many cases of narrow cleft combined with a high palatal arch, it is not difficult to coapt the edges precisely and without tension after separation of the mucoperiosteum from the hard palate (Figs. 3 and 4). For the separation of the mucoperiosteum, Brophy's periosteum elevators, curved at right angles on the flat, are in every way efficient.

In cases of high palatal arch, therefore, if the cleft be not too wide, it is useless to make paralyzing incisions for the relief of tension, for the two halves of the loosened mucoperiosteal palate will fall together like the two halves of a cantilever drawbridge, and may be sutured without tension. It should be remembered that the soft palate must be quite completely separated from the hard palate at the posterior border of the latter.

The simple uniting of such loosened flaps with mattress sutures, as suggested by Sherman, is an ideal procedure in theory and a very satisfactory one in practice. The use of any mechanical contrivance, like Brophy's lead plates and silver wire, or cleats of any kind, is to no purpose in such a case, if indeed they are ever desirable. When the lead plates are used, the strain comes upon the cutting edge of the silver wire. The most careful study of the mechanics of this proposition cannot convince one that the pressure is to any considerable degree distributed over the under surfaces of the lead plates.

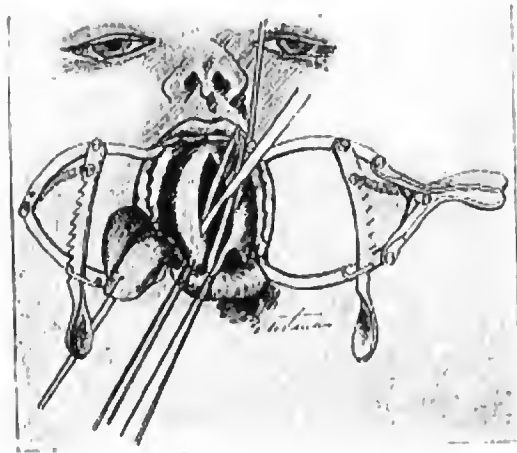
The simpler the technic, the better. Even many of the special instruments may be dispensed with. Small French needles serve admirably and there is no better needle holder

FIG. 1.



Position of patient in operation for cleft palate.

FIG. 2.



Denudation of margin of cleft. Removal of strip in one piece.

FIG. 3.

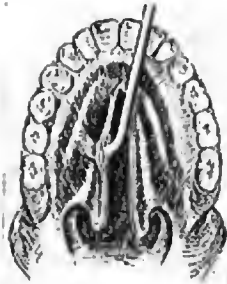


FIG. 4.

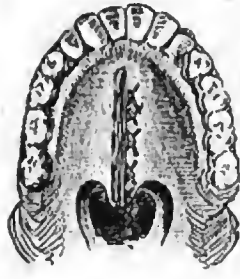


FIG. 5.

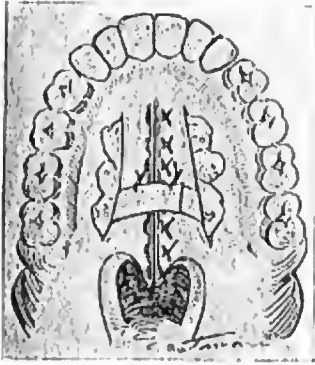


FIG. 6.



FIG. 3. Separation of mucoperiosteal flap with Brophy's periosteotome. High palatal arch.
 FIG. 4. Mattress suturing without relaxation incisions after loosening of mucoperiosteal covering from a high arched palate.
 FIG. 5. Palate with low arch and wide cleft.
 FIG. 6. Wide cleft closed with mattress sutures after dissecting of flaps and making relaxation incisions. Incisions packed with sterile gauze.

FIG. 7.



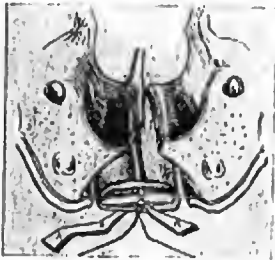
Sherman's technic, relaxation incisions, mattress sutures, tape impregnated with wax and iodine encircling the flaps to prevent tension upon sutures. Relaxation incisions packed with 5 per cent. iodoform gauze.

FIG. 8.



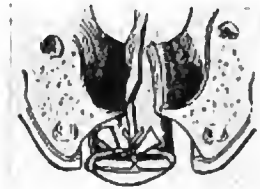
Charles Mayo's method. Unwaxed tape passed under flap.

FIG. 9.



Tape tied with single turn and secured by silk ligature, ends hanging into the mouth.

FIG. 10.



The ends of the tape and silk ligature cut short and turned around to nasal surface out of reach of patient's tongue tip.

than a good Halsted artery clamp, the serrations upon whose jaws have been filed down a bit.

The less machinery there is in a child's mouth for it to poke at with the tongue tip, the less the likelihood of failure. It is submitted, therefore, that in cases of reasonably narrow cleft and high palatal arch, it is wise simply to loosen muco-periosteal flaps on each side and unite the margins with mattress sutures, the same having been properly denuded. If the arch be low or the cleft be wide, or both, then Sherman's and Mayo's technic of making lateral incisions for the relief of tension and uniting by mattress sutures will, in most cases, suffice (Figs. 5 and 6). In such cases, a gauze packing in the lateral incisions, as introduced by Charles Mayo and employed by Sherman and many others, will splint or support the flaps better than any mechanical contrivance, and better, in the experience of the writer, than the tape encircling the flaps used by Charles Mayo.

Mayo and Sherman use 5 per cent. iodoform gauze for the packing of the lateral incisions. The iodoform in the gauze, however, serves no very important purpose and may do harm, as I have found, by inducing disagreeable if not alarming gastro-intestinal disturbances or actual intoxication. Sherman remarks that the iodoform controls saprophytic action. This, however, is by no means as important as the prevention of too prompt healing with coincident increase of tension. Plain, sterile gauze splints the flaps as well and is, of course, more pleasant to bear in the mouth.

Sherman's practice (Fig. 7) of using tape filled with wax and impregnated with iodine to prevent absorption of bacteria and consequent infection of the mouth, represents an advance, perhaps, over the use of simple, unwaxed tape as introduced by Charles Mayo (Figs. 8, 9 and 10), but there still remains in the use of the tape, waxed or unwaxed, some danger of strangulation of the flaps.

The results of the operation of denudation, loosening of the flaps from the hard palate, making of lateral incisions for relief of tension, mattress suturing and packing of the lateral

clefts with sterile gauze, will not be greatly improved by the addition of the encircling tape, waxed or unwaxed. In other words, the simple operation combining the suggestions of Sherman and Mayo seems most efficient if the tape be discarded (Figs. 5 and 6).

For the suturing of cleft palate, about every known material has been tried, and there still obtains great diversity of opinion as to what constitutes the best suture material for this purpose. Lane uses fine Chinese twist. Silk, linen, hemp and horse hair are all used, as is silver wire by Brophy. Silkworm gut is the material chosen by most American operators for the uniting of the margins in cleft palate.

Bunge, of Königsberg, coapts the margins by means of a continuous wire Halstead suture and over this places the usual mucous sutures of silk. The wire suture is removed by drawing upon the anterior end.

In clefts of the soft palate, Ochsner splits the edge of the cleft throughout its entire extent, beginning at the tip of the uvula on one side and extending the incision around the entire cleft to the tip of the uvula on the opposite side. This produces a broad surface for coaptation. He uses two rows of horse hair sutures—one row with the knotted ends turned toward the nasal side, the other row with the knots upon the oral side.

The writer certainly does not wish to dogmatize upon so important a subject, but wishes respectfully to call attention to the usefulness of chromic catgut of small size for this purpose. It remains undissolved in the palate as long as there can be any possible use for it, resists infection heroically, and within ten days or, at most, two weeks, has quite disappeared, doing away, therefore, with the procedure of removing the stitches, a laborious performance, not unattended by annoyance and danger of breaking the union in the palate of a crying, twisting infant.

Chromic catgut is more easily introduced than silkworm gut. It is softer and more pliable. The disposition of silkworm gut to shape itself, owing to its springiness, into a ring

is not infrequently responsible for the first laceration of the tissues which results in complete cutting out of the suture. There is no hope for any cleft palate operation in which there is tension of any kind on the sutures.

To recapitulate, it is proposed that simple mattressing of the bevelled edges of the freely loosened flaps in high palatal arches and in lower arches and the addition of relaxing incisions packed with sterile gauze to splint the flaps, the sutures being of chromic catgut, will meet every requirement for the restoration of the defect in the majority of cases of cleft palate.

In Lane's technic for narrow cleft (*Ibid.*), "if the soft parts overlying the edges of the cleft are thick and vascular, a flap is cut from the mucous membrane, submucous tissue and periosteum of one side, having its attachment or base along the free margin of the cleft. The palatine vascular supply is divided while the flap is being reflected inwards, and it depends for its blood supply on vessels entering its attached margin.

"The mucous membrane, submucous tissue and periosteum are raised from the opposing margin of the cleft by an elevator, an incision being made along the length of the edge of the cleft.

"The reflected flap with its scanty supply of blood derived from small vessels in its attached margin is then placed beneath the elevated flap whose blood supply is ample, and it is fixed in position by a double row of sutures. In this manner two extensive raw surfaces, well supplied with blood and uninfluenced by any tension whatever, are retained in accurate apposition" (Figs. 11, 12, 13, 14 and 15).

If a wide gap is found to exist in the soft palate, Lane dissects up a flap consisting partly of mucoperiosteum from over the hard palate and partly of the oral layers of the soft palate. He turns this flap over door-like, it having been dissected free down to the edge of the cleft, and sutures it to the freshened edge upon the opposite side of the defect.

In cases of very wide defect, after dissecting up a flap on one side from the oral surface of the soft palate, a similar

flap is dissected free from the upper or nasopharyngeal surface of the soft palate. It is then possible to fill in the defect by applying these flaps to each other, raw surface to raw surface, so that the tissue bridging the defect is covered more or less completely both above and below by mucous membrane (Figs. 18 and 19).

Ferguson, of Chicago, also imbricates in a similar manner large mucoperiosteal flaps taken from the oral surface upon one side and from the nasal surface upon the other.

The older Davies-Colley operation sought to accomplish the same end—that of filling in the gap by a bridge of tissue covered both above and below by mucosa. However, until it is more clearly established that a really useful purpose is conserved in primarily providing a mucous floor for the nasal space (it being very certain that finally in all cases a very complete mucosa covering for the nasal space is formed), it is useless to take the risk of sloughing incident to turning over the long flap attached at one end only in the Davies-Colley procedure.

In wide clefts in young infants, Lane includes in the oral flap, mucosa from the cheek. That is, the area from which the flap is taken extends over and beyond the alveolus and around on the cheek (Figs. 16 and 17).

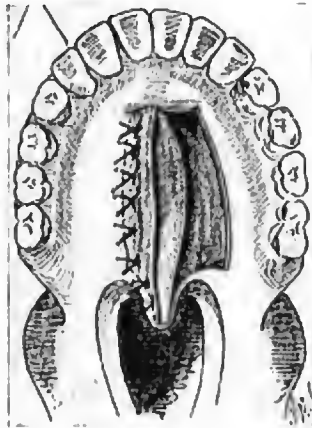
It is clear that after separation of the mucoperiosteum from the hard palate, it will be necessary, no matter what the shape of the palate vault may be, to separate the soft palatal portion of the flaps from the posterior margin of the hard palate to the end that the margins of the cleft may be coapted without tension. J. Barry makes an important point of the separation of the soft from the hard palate in mobilizing the flaps. Of course, this means upon the nasal side alone. The continuity of the soft palate with the mucoperiosteum split up from the oral surface of the hard palate is in no sense impaired, but with knife or scissors introduced through a lateral incision and under the mucoperiosteum of the hard palate, cutting upward toward the nasal space, the soft tissues are freed from the sharp, posterior edge of the hard palate and, if necessary,

FIG. 11.



Lane's method of removing mucoperiosteal flap from hard and soft palate upon one side of the cleft, and tucking the edge of this flap under the mucosa through a slit upon the opposite side of the cleft.

FIG. 12.



Edge of flap tucked under slip upon opposite side of cleft and sutured.

FIG. 13.



FIG. 14.

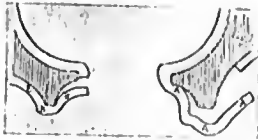
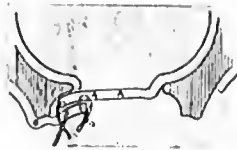


FIG. 15.



Diagrammatic sketches of technic shown in Figs. 11 and 12.

FIG. 16.

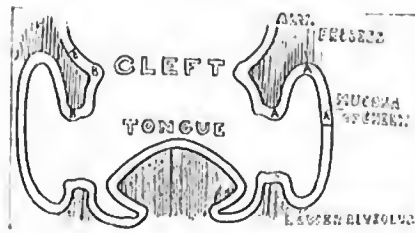
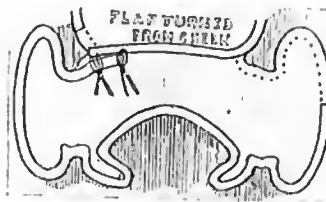
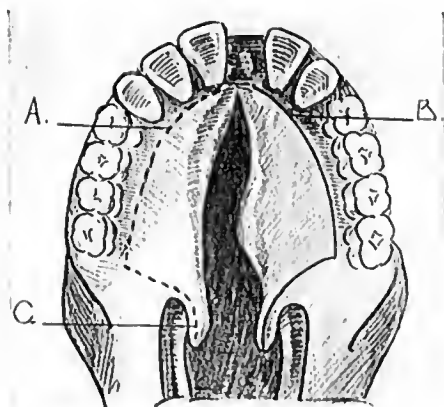


FIG. 17.



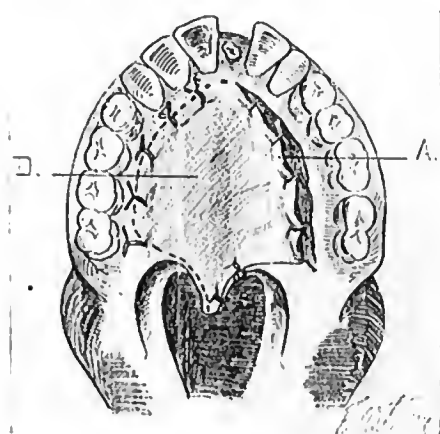
Figs. 16 and 17. Very wide flap, including mucosa covering alveolus and extending around upon the cheek; used by Lane in very broad clefts.

FIG. 18.



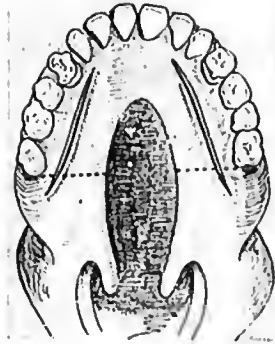
Lane's or Ferguson's method: *A*, incision upon nasal side of palate for turning down flap; *B*, incision upon oral side for loosening of mucoperiosteal flap. (After Ferguson.)

FIG. 19.



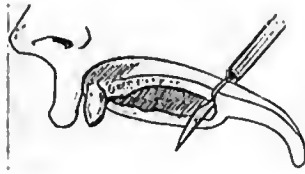
The nasal and oral mucoperiosteal flaps with raw surfaces apposing, leaving a mucous covering upon the nasal and upon the oral side of the new palate. (After Ferguson.)

FIG. 20.



Operation after J. Barry: Classical slits upon each side for relaxing of tension and separation of flaps.

FIG. 21.



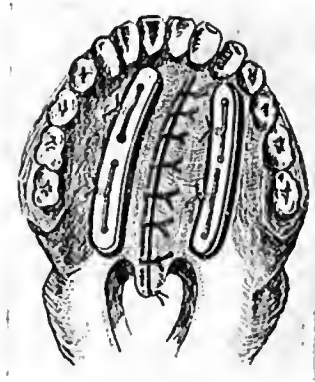
Severing of the soft from the hard palate with knife passed through lateral slit to edge of cleft on each side. Barry regards this as an important factor in securing relaxation.

FIG. 22.



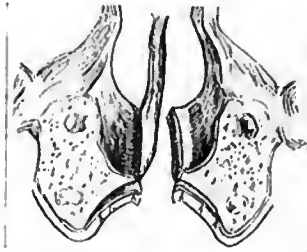
Soft palate separated from hard palate at sharp anterior edge of latter, completely liberating the flap.

FIG. 23.



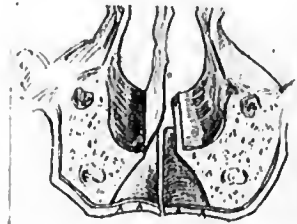
Hopphy's lead plates securing silver wire relaxation sutures.

FIG. 24.



Diagrammatic drawing showing loosened mucoperiosteal flap taken from a high palatal arch.

FIG. 25.



Flaps from the two sides of a high palatal arch falling together like the two halves of a cantilever drawbridge.

the mucosa upon the nasal side is cut through (Figs. 20, 21 and 22).

No doubt every surgeon in dissecting up the mucoperiosteum and pushing the flaps toward the median line, breaks up this attachment more or less completely. However, if it be done as a definite step, it will save unnecessary scraping and trauma to the flaps.

Barry's observations upon the use of lateral incisions correspond with those of Charles Mayo and are eminently practical. It is folly to attempt to close any gap with sutures which are under tension, and it is a matter of record and experience that this tension cannot be taken off the suture by the complicated devices presented for the purpose. The lateral incisions, unless they are quite ruthlessly made, need not permanently paralyze any part of the soft palate.

Those who have observed these cases for a few years after operation have become convinced that the paralysis, even if the posterior palatine artery and the levator and tensor palati muscles be divided, is only partial and temporary. Such incisions need never include division of the hamular process as in Billroth's procedure.

There is no need of making them in cases of high palatal arch, as Brophy has clearly proven, but if they are needed to relieve tension, such incisions should be made not ruthlessly but to meet the demands of the specific case. The edges of the cleft should be drawn together and incisions made exactly where they are needed, a gradual cut-and-fit plan being followed.

Compression in the treatment of cleft palate, according to extracts in *Dental Cosmos*, the *Australian Medical Record* and the *Dublin Medical Press*, and cited by Garretson ("A System of Oral Surgery"), was conceived some time prior to 1851.

The operative procedure for immediate cure of congenital fissure of the palate is described by Garretson as follows:

"An instrument, a modification of the Hoey clamp, ordinary arterial compressor, or a Hainsby compress, is to be

made by so arranging the pads that they shall apply to the sides of the jaw and allow of the force being so directed that the pads can be approximated without undue facial pressure. The clamp of Hoey, it will be seen, needs alteration only so far as the pads are concerned and is quite easy of adjustment to this purpose.

"The instrument ready (the infant being in proper condition), the operator commences by paring the soft parts and bone on both sides of the fissure, beginning on the approximal faces of the palate bones and cutting forward to the alveolar face of the chasm. This part of the operation completed, the little patient is to be allowed to rest until the bleeding ceases. A succeeding step is to re-etherize and apply the compressor; the curved pads to embrace the buccal faces of the alveolar arch. By now gradually turning the screw of the instrument, the yielding bones are brought together. The next and last step in the operation is to retain the parts in position by the use of compresses placed upon and below the malar bones and secured by adhesive strips applied as in the occipitallabial cravat of Mayo.

"It may be urged against these manipulations that they are formidable and entirely too heroic; that fractures may result, etc. On these points the surgeon must decide for himself. If carefully performed, the operation is not dangerous; fracture of the bone, even if it occur, is of little consequence, the parts having to be kept, as it were, in splints, consequently the treatment of the one would be the treatment of the other. The marked risk is from inflammation that may be provoked; but a surgeon not infrequently has to go to far greater lengths for even a smaller result."

The manner of holding together the two superior maxillæ, as practised by Brophy, of Chicago, differs from the older methods in that the two upper alveoli are forced and held together by means of stout silver wire. Brophy occasionally divides the malar process to the end that the edges of the cleft may be forced together.

If the operation be done in a very young infant, subse-

quent growth and development may overcome the narrowing of the channels consequent upon this compression, but perhaps not.

In the Brophy operation, with a stout needle threaded with silk or celloidin hemp, strong silver wire is passed through the superior maxillæ just back of the malar process and high enough to be above the palate. In other words, the wire passes from the outer surface of one alveolar process through both sides of the upper jaw to the outer surface of the other. One or two additional wires are passed through both superior maxillæ and in front of the first. The ends upon each side are twisted together over lead plates after the edges of the cleft have been forced together by powerful compression of the two superior maxillary bones between the operator's thumbs.

It is Brophy's observation that the difference in the distance between the two upper alveoli and the distance between the two lower is equal to the width of the cleft.

In cases of complete cleft palate in the new-born, the operation of Brophy is certainly the most rational one to which we can have recourse. The dangers from shock and sepsis have been, it seems, somewhat exaggerated, but even if there be some additional risk in the Brophy operation, is it not better to assume such risk in the hope of securing the best results, particularly as to the obviation of the speech defect? If Brophy's contention as to the greater width of the upper jaw be true, and there seems to be little doubt of it, articulation and occlusion of the teeth should be improved and not impaired by the compression of the upper alveoli.

It is unfortunate that physicians generally are indifferent concerning the important matter of operating cleft palate early. The operation of Brophy, with the present appreciation of this matter, is applicable in a comparatively small number of cases only.

In cases seen somewhat too late for the Brophy operation and with large defect of the hard palate, Ochsner's operation of chiseling upward between the alveolar processes and the

bony palate and forcing each half of the bony palate inward toward the median line, offers the best substitute for compression of the upper jaws which might have been practicable had the case been seen when the bony parts were pliable.

It is true of the western section of the United States at any rate that only a small proportion of cleft palate cases is seen by the surgeon during the first few weeks, and of these only a part are suitable cases for Brophy's technic. The field of its application is, therefore, at present limited. Its use involves forcibly pressing together the two sides of the upper maxillary arch with consequent narrowing of the nasopharynx and vault of the mouth. If good judgment is not used in the selection of cases for the Brophy technic, this very beneficent operation will, of course, disappoint.

G. V. I. Brown (*Journal A. M. A.*, February 1, 1908), has found that "where forcible means have been employed in early infancy to bring the sides of the fissure into direct or too close approximation, the arrested development of the maxillary bones makes the anterior portion of the mouth too small for accommodation of the tongue in the utterance of word sounds. This disadvantage is increased by the fact that on account of early derangement of the developing teeth through forcible compression of the parts, not only are the incisors, cuspids and bicuspid erupt in such position as to reduce the size of the dental arch, but frequently one or more teeth erupt almost in the central portion of the palate."

There is little doubt but that the failure to choose the proper operation for the specific case is more often culpable for failure than hemorrhage, vomiting or any of the other recognized causes of failure. There are so many varieties of cleft palate that there can never be a single operation which will apply in all cases. There always will be many operations. The development of the art cannot eliminate them.

It is of fundamental importance that a suitable method be chosen for the case in point. Elaborate staphylorrhaphies are, no doubt, frequently made when small pivot-flap operations are best suited to the condition and many palate defects

considered hopeless, so far as Brophy's plan is concerned, can be corrected, for example, by Lane's method of pushing over flaps which embrace all the mucosa from the edge of the cleft to an arc on each side over and beyond the alveolus, it being assumed, of course, that the teeth have not yet erupted.

Bad remote results may be expected to follow operations in which the soft palate is stiffened too much by traction due to scar formation, just as tension upon the sutures is the most common cause of immediate failure.

A fruitful source of trouble after operation is the swallowing of blood which in the sensitive stomach and intestine of a young infant, particularly in hot weather, may set up a condition very like that produced by the active fermentation of indigestible food with annoying if not alarming symptoms of autointoxication. After cleft palate operations, the patient should be nourished by the administration of nourishing food in the form of rectal enemata during the first two days. If the loss of blood has been considerable, normal salt solution should be given by the bowel, but feeding by the mouth may be dispensed with during the first two days, after which sterile milk should be given to the exclusion of everything excepting sterile water. If the infant is so weak that it cannot get on with rectal feeding for two or three days, it should not be operated upon until it has sufficient vitality, unless the operation be one of emergency.

In almost every case of harelip, the nose is flattened. In unilateral cleft, it is usually seen that the ala of the nose is broader upon the side corresponding to the cleft (Fig. 26). In double harelip, both alæ and both nostrils are widened. To the end that there may be no tension upon the lip sutures and that the nostril or nostrils may not be too broad, it is important that before suturing the freshened lip margins, the nose be separated from its deep connections upon the side concerned if the harelip be single or upon both sides if the case be one of double harelip. This is readily done through a transverse incision at the junction of the upper lip mucosa and gum with a pair of scissors passed through this incision upward between

the lip and the superior maxilla (Fig. 27). The soft tissues are completely separated from the bone over an area large enough to render the *alæ* freely movable.

With the upper lip everted and pulled upward, the mucosa may be easily split at its attachment to the gum. In answer to the question as to the extent of the separation of the soft parts from the bone which suffices, Binnie answers that "keeping close to the bone the soft parts should be freed until the edges of the cleft when placed together show a tendency to lie in apposition so that the sutures when introduced may be tied without giving rise to tension." Some care should be taken that the separation be made with dull instruments in the neighborhood of the infra-orbital foramen in order to avoid injury to the infra-orbital nerve and vessels.

The importance of relieving tension by separation of the nose from its deep connections has been emphasized by Charles H. Mayo. As necessary, however, as this step may be, it is not more useful in practice than the measure of passing a fine chromic catgut suture through the base of the septum and the base of the *ala* on the involved side, which when tied will draw and hold these attachments in the proper relationship for the establishment of a normal, narrow nostril. This suture is passed up through the transverse incision in the mucosa at its reflection from gum to lip. Even if the soft parts be quite freely separated from the bone, the unfastened *ala* tends to creep back into its abnormal position, maintaining a broad and unsightly nostril. The measure of keeping the nostril narrow with the buried chromic catgut suture should always follow the loosening of the nose from the bone.

In most cases of harelip, horse-hair sutures meet the indications. Both the deep sutures and those for precise coaptation of skin and mucosa may, as is well known, be of horse hair. Neither silk nor silkworm-gut sutures have any demonstrable superiority over horse hair. Horse-hair suturing without dressing represents at once the simplest and most satisfactory practice.

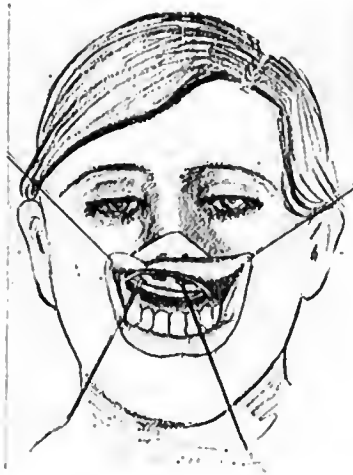
In a certain very small percentage of cases, retention

FIG. 26.



Method of narrowing the flaring nostril. Shaded area is that over which the lip and nose are separated from all attachments to the superior maxilla.

FIG. 27.



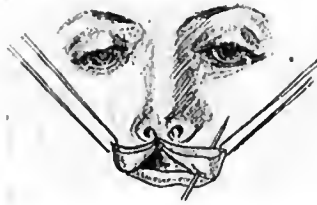
Incision made at attachment of lip mucosa to gum. A suture is in place for drawing the base of the ala toward the base of the septum.

FIG. 28.



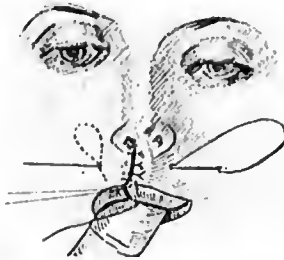
Author's method of preventing notching. The horse-hair sutures at the top and bottom of the united cleft margins are left long and tied over a small roll of gauze. This small roller of gauze is efficient in removing strain upon the horse-hair sutures. Leaving the ends of the top and bottom sutures long, greatly facilitates the introduction of the horse-hair sutures upon both skin and mucous surfaces.

FIG. 29.



Showing manner of introducing retention suture, according to Lane. Needle carrying silk suture is passed clear through the lip from inside to outside, about one-third of an inch from the prepared edge of the cleft

FIG. 30.



After having been drawn through, the needle is reintroduced at the aperture of exit in the skin and is passed across to a point at a corresponding distance from the edge of the cleft upon the opposite side, the course of the needle being just under the skin. The needle is again passed, starting at the second aperture of exit in the skin, through the lip to the mucous surface where the ends are tied.

FIG. 31.

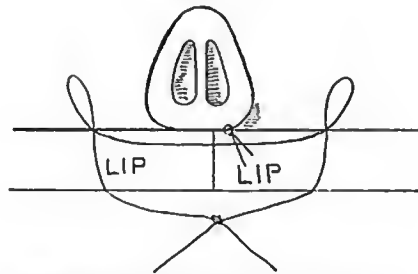


Diagram showing the course of Lane's retention suture.

FIG. 33.

FIG. 32.



Relaxation by means of adhesive plaster cut dumb-bell shape, securing small pad of gauze.



Dr. H. R. Allen's clock-spring relaxation absorber.

FIG. 34.



Relaxation by Ferguson's or Taylor's circular strap of adhesive, which effectually controls the risorius and orbicularis oris to a considerable extent without making pressure upon the wound area.

sutures may become necessary. For these silver wire is useful. When silver wire is used for suturing, it is usually attached in a clumsy manner to a straight or curved needle by simply bending back one end of the wire after it is passed through the eye. It may, of course, be introduced somewhat more easily by using a needle armed with a loop of silk thread with which the wire suture is drawn into position. The free ends of the sutures are then twisted or slotted or secured by glass beads, according to the degree of tension and the character and location of the wound.

If wire be threaded indirectly through the eye of a needle and doubled backward upon itself, there will be formed at the necessarily broad butt end of the needle an awkward lump. To jerkily draw this through delicate tissues, like those of the soft palate or the lip of a young infant, must, in the nature of things, cause tearing and contusion which detract from the usefulness of the suture. The jerking of the lump of wire through the tissues is especially disagreeable after one or more sutures have been introduced and secured, the likelihood of loosening or displacing such already adjusted sutures being considerable. The entrance and erratic excursions of the loop of wire produce an unnecessarily large skin opening and stitch canal and predispose to infection and consequent "cutting out" of the suture.

To obviate these difficulties, I have used in harelip operations a fine silver wire suture eighteen inches in length, to one end of which is attached with silver solder, after annealing of both metals, a full or half-curved steel needle. This gives a perfectly smooth joint which may be drawn through delicate tissues without adding unnecessary laceration to that produced by the needle point and which does not catch abruptly at the skin. In most cases, eighteen inches of wire will suffice for a half-dozen sutures, a piece of the desired length being cut from the distal end of the wire after each introduction of the needle. The needle, after the sutures have been thus cut away, may be rearmed with wire or discarded.

Some years ago there was introduced to the profession a

silver wire needle with a hollow threaded butt into which a wire suture might be screwed and fastened. This needle has not come into general use for the reasons that its butt, though bevelled in both directions, is much larger in diameter than the wire it admits and its attachment to the wire is insecure.

Silver wire is generally recognized as a useful suture material. It is easily sterilizable. Moreover, it has been repeatedly demonstrated that metallic silver has an inhibitory effect upon the growth of bacteria. A properly prepared silver wire suture is, therefore, not simply aseptic but more or less "antiseptic."

Silver wire is unirritating and strong. If it is sterilized by heat, as by boiling in soda solution—with instruments—the metal becomes annealed and is thus rendered soft and pliable and less liable to break when twisted.

A beaded wire suture is easily removable since the bead is not apt to be obscured by the swollen tissues and is easily seized with forceps and cut from the wire. After the suture has been introduced and cut off to the desired length, the ends are passed each through a perforated bead.

The malleability of silver enables the surgeon to give to the wire suture any desired bend. This is impossible with a silkworm-gut suture which, wherever possible, assumes the form of a ring. This disposition of silkworm gut to shape itself, owing to its springiness, into a ring, is, as has been previously noted, often responsible for the first laceration of the tissues, which results in "cutting out."

It will, however, rarely be necessary to use a suture of the character of wire. In almost every case of harelip, strong horse hair is in every way satisfactory. The elasticity of horse hair and its possibility of almost complete sterilization, together with its relatively small diameter, militate against scar formation. It is the only suture material in use which grows naturally in the skin. It is constructed of epithelium, is non-irritating, and, if properly prepared, is the best possible suture material for use in the skin anywhere. It cannot be tied too tightly, for it will break if drawn too forcibly.

The writer's method of arranging the horse-hair sutures is as follows:

After freshening the edges of the cleft according to the method suitable in the particular case, the first horse-hair suture is introduced at the top of the cleft, penetrating the skin about one-eighth of an inch from the edge of the cleft on one side and emerging at the mucous border. It is then passed through the flap on the opposite side in the same way except in the opposite direction. This top suture is tied and the ends left long. Then at the junction of the skin and the vermilion mucous border a similar horse-hair suture is passed, precisely coapting the mucosa. It is tied and the ends left long. Traction upon the ends of these two sutures coapts the freshened edges of the cleft so that intervening sutures may be put in easily. Especially is this true of the horse-hair sutures upon the mucous surface, the upper lip being everted and pulled upwards by traction upon the lower of the two guy sutures, the entire length of the freshened edges of the mucosa is exposed.

In order to avoid the occurrence of a notch on the lip after the wound has shrunk, after freshening is done according to one of the well known methods suitable in the case and after introducing the horse hair sutures as described above, a little roll of gauze about the size of the distal phalanx of one's little finger is fixed with its long axis transversely to the plane of suture and the long ends of the uppermost and lowest horse hair sutures are tied over the little gauze roll so that the line of suture is wrapped, so to speak, around the gauze for about two-thirds of its circumference (Fig. 28). This simple plan will effectively prevent notching after healing is complete and, moreover, it keeps the dressing in place, a matter of no slight importance.

Lane almost invariably introduces two relaxation sutures as follows:

He starts the needle upon the mucous side about a third of an inch from the edge of the cleft, passes straight through the lip and out upon the skin side. He then introduces the needle at its minute aperture of exit and passes across the

plane of suture to the opposite side, keeping the needle just under the skin and emerging again about one-third of an inch from the wound margin. He then passes the needle back through this second opening in the skin, penetrating all of the tissues of the lip, including the mucosa.

The suture is tied upon the mucous surface, an objection being that the knot is left upon the mucous surface where the infant will instinctively poke at it with the tongue (Figs. 29, 30 and 31).

Such sutures should be omitted if possible. If found necessary and silver wire be used for this purpose, the child will not poke with the tongue tip at the sharp ends. Lane uses Chinese twist.

Devices for relieving tension after harelip operations should not come into contact with the wound. It is a common practice to use a strip of adhesive plaster passing from cheek to cheek. Such a strip of plaster is likely to produce undesirable pressure upon the wound. The strip of plaster is usually cut dumb-bell shape with the narrow part across the upper lip, covering just as little of the lip as possible (Fig. 32).

It is much better to use the plaster after the fashion suggested by A. S. Taylor or A. H. Ferguson. Taylor's dressing consists of two narrow strips of adhesive plaster (about $\frac{3}{8}$ inch or 1 cm. wide), starting well down on the cheeks, crossing each other over the bridge of the nose and passing well out on the forehead. Originally, a little square of gauze was used to protect the bridge of the nose and the inner ends of the eyebrows from the plaster, but the later dressing is a great improvement. The plaster which would lie over the nose and eyebrow is cut out on each side and folded under so that the adhesive surface is eliminated.

Ferguson's suggestion is as follows: Take a strip of plaster one inch wide and about twelve inches long, place the centre of the strip beneath the chin, pull firmly on both ends, allow the plaster to adhere to both cheeks well back and then cross the plaster over the nose on to the forehead. Where the plaster passes over each eye, roll the strip on itself into a cord.

This effectually prevents tension on the sutures, even when the child is crying. The line of incision should never be sealed either with colloidin or plaster (Fig. 34).

H. R. Allen has recently presented a spring "tension absorber" (Fig. 33) which is in principle somewhat similar to the older Hainsby compressor which consists simply of a spring which passes around the head, having a small pad at each extremity. The spring was of such circle and character as to bring the pad to the labial commissures.

The application of the adhesive plaster, according to Taylor and Ferguson is especially useful, for if the tension-removing device cover the wound and is removed for a dressing, its support is lost just at the time when the child is sure to cry and struggle harder. Straps crossing the wound are unnecessary for as Binnie says, "if the soft parts of the lip and cheeks have been sufficiently separated from the bones at the beginning of the operation, then such a measure is unnecessary and undesirable, as it simply irritates the already irritable patient. It is not necessary to apply any dressing to the wound as nature soon seals it with dried blood-clot. Until the sutures are removed, there should be as little interference with the wound as possible. If it is going to heal, it will heal under the scab and the best intentioned endeavors to clean the wound will merely interfere with *nature's* work and do no good, as cleanliness can never be attained in such cases. Care must be taken so to fix the little patient's arms that scratching of the wound is rendered impossible."